Five-Year Review Report

Second Five-Year Review Report
For
Carson River Mercury Site
Cities of Dayton and Silver City
Lyon County, Nevada

September 30, 2008

Approved by:

Kathleen Salyer, Assistant Director
Superfund Division
California Site Clean-up Branch
USEPA, Region 9

Date:

9/30/08

[This page intentionally left blank]

Table of Contents

Table of Contents, Continued

Tables *(located within body of text)*

Figures *(located after end of text)*

Attachments *(located after end of text)*

Acronyms and Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirement
BCA	(NDEP) Bureau of Corrective Actions
CC&Rs	Covenants, Conditions and Restrictions
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRMS	Carson River Mercury Site
cy	Cubic yards
DNM	Durable Notification Mechanism
EC	Environmental Covenant
EPA	Environmental Protection Agency
FYR	Five Year Review
IAG	Interagency Agreement
IC	Institutional Control
LTSRP	Long-Term Sampling and Response Plan
mg/kg	Milligrams per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDEP	Nevada Division of Environmental Protection
NPL	National Priority List
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PDT	Project Delivery Team
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
TBC	To Be Considered
TCLP	Toxicity Characteristic Leaching Procedure
US	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

[This page intentionally left blank]

Executive Summary

The Carson River Mercury Site (CRMS) is located east of Carson City, Nevada and includes more than 50 miles of mercury contaminated river, reservoir, and wetland sediments in the middle and lower portions of the Carson River system. The Site also includes more than 50 mill sites, their associated tailings piles, and subsequent mercury contaminated soils upland of the river. Mercury was used to process gold and silver ore mined in the latter part of the 19th century as part of the "Comstock Lode." Operable Unit 1 (OU1) consists of the upland mercury-contaminated mills, tailings and soils, while Operable Unit 2 (OU2) contains the mercury contamination associated with the Carson River system. OU2 is still in the Remedial Investigation/Feasibility Study (RI/FS) phase. A remedy for OU1 was selected in a Record of Decision (ROD) in 1995. This FYR (FYR) evaluates the adequacy of the OU1 cleanup remedy to protect public health and the environment.

The remedy for OU1 was surface soil removal and/or capping of four residential areas in Dayton and Silver City, where mercury exceeded site-specific cleanup levels for soil. ICs (ICs) were part of the Record of Decision for these properties, to ensure that any subsurface soils with mercury above cleanup levels were not disturbed. In addition, a Long Term Sampling and Response Plan (LTSRP) was required, to ensure sampling, and, if needed, remediation was performed for properties which might be developed. The Dayton and Silver City remediated areas achieved construction completion in December 1999. The trigger for this second FYR was the completion of the first FYR for OU1, in September 2003.

This FYR found that the cleanup at the four areas in Dayton and Silver City was completed in accordance with the Record of Decision. However, the ICs for these remediated areas were not implemented as intended. The FYR found that sampling and remediation of properties covered under the Long Term Sampling and Response Plan is being done, if required. However, information on these ICs is not readily accessible. There is also a category of smaller developments of less than five residential units or less than five acres that is not captured by the ICs in the LTSRP. Therefore, the conclusion of the second FYR is that the remedy for OU1 of the Carson River Mercury site, as currently implemented, is not protective of human health and the environment.

[This page intentionally left blank]

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Carson River Mercury Site

EPA ID *(from WasteLAN)*: NVD980813646

Region: 9	**State:** NV	**City/County:** Dayton and Silver City, Lyon County

SITE STATUS

NPL status: ☒ Final ☐ Deleted ☐ Other (specify)

Remediation status (choose all that apply): ☐ Under Construction ☐ Operating ☒ Complete (OU1)

Multiple OUs?* ☒ YES ☐ NO | **Construction completion date:** ___ / ___ / _____

Has site been put into reuse? ☒ YES ☐ NO

REVIEW STATUS

Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author name: Jere Johnson

Author title: Remedial Project Manager | **Author affiliation:** EPA Region 9

Review period:** 9/30/2003 to 9/30/2008

Date(s) of site inspection: 3/3-6/2008

Type of review:

☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: ☐ 1 (first) ☒ 2 (second) ☐ 3 (third) ☐ Other (specify) _____

Triggering action:

☐ Actual RA Onsite Construction at OU #____
☐ Actual RA Start at OU#____
☐ Construction Completion
☒ Previous Five-Year Review Report
☐ Other (specify)

Triggering action date *(from WasteLAN)*: 9/30/2003

Due date *(five years after triggering action date)*: 9/30/2008

* ["OU" refers to operable unit.]
**[Review period should correspond to the actual start and end dates of the FYR in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

1. The CRMS areas of concern are not well defined to enable ICs to be focused on the needed properties; developments smaller than five residential properties or five acres are not captured in the permitting process that triggers ICs; the LTSRP is still a draft document; recorded information on ICs for specific properties is not readily accessible to current and future land owners, users and developers.

2. ICs have not been implemented in areas remediated in 1999, to prevent disturbance of subsurface soils which may contain mercury above cleanup levels. Also, periodic inspections (e.g., more frequent than the FYR) of the remedial actions for these properties are not being performed as recommended in the first FYR.

Recommendations and Follow-up Actions:

1. Improve CRMS boundary maps and better define areas of concern needing ICs; develop IC mechanisms to address developments smaller than five residential properties or five acres; adopt final LTSRP; work with Lyon County to ensure that information on recorded ICs is accessible to current and future land owners, users and developers.

2. In coordination with NDEP, BCA and Lyon County, implement appropriate ICs to prevent exposure to mercury above cleanup levels at areas remediated in 1999. Perform inspections on a periodic basis to ensure integrity of the remedy for these areas is maintained.

Protectiveness Statement(s): The remedy at the Carson River Mercury Site OU1 is not protective of human health and the environment because the ICs for the four properties remediated under the ROD are not in place and information on the recorded ICs for properties covered under the LTSRP is not readily accessible. In addition, a category of properties (developments smaller than five residential units or five acres) does not have an ICs trigger mechanism. The soil removal and replacement element of the ROD was implemented as planned and the sampling and remediation aspects of the LTSRP are operating as intended for developments of five or more residential units or five or more acres.

Other Comments:

None.

Carson River Mercury Site
Dayton and Silver City, Nevada
Second Five-Year Review Report

I. Introduction

This is the second FYR report of Remedial Actions for the Carson River Mercury Site (CRMS) in Lyon County, Nevada. The first FYR report completed in 2003 was the triggering action for this review. The Site has been divided into two operable units (OUs): 1) the uplands soil, OU1, and 2) the waters and sediment associated with the Carson River, OU2. This FYR addresses the completed OU1 remedy. OU2 is in the Remedial Investigation/Feasibility Study (RI/FS) stage.

The purpose of a FYR report is to determine whether the remedy at a Superfund site continues to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in the FYR reports. In addition, FYR reports identify issues found during the review, if any, and identify recommendations to address those issues.

The United States Environmental Protection Agency (EPA) is preparing this FYR report pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121(c) states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such a review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.*

The purpose and focus of FYRs are further defined in EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-03B-P (EPA 2001).

This review was conducted with technical assistance provided by the U.S. Army Corps of Engineers (USACE), Seattle District, between November 2007 and September 2008. The Seattle District USACE project delivery team (PDT) prepared this FYR report through an Interagency Agreement (IAG) between EPA Headquarters and USACE.

This second FYR report is a statutory review, following five years after the completion of the first FYR report signed September 30, 2003. This statutory review is required because the remedial action occurred after the Superfund Amendments Reauthorization Act (SARA) of 1986 and resulted in hazardous substances being left on site above levels that allow for unlimited use and unrestricted exposure. The first FYR report was triggered by the presence of hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

The following table summarizes, in chronological order, the major milestones or notable events for the Carson River Mercury Site.

Table 1 – Chronology of Site Events

Event	Date
Discharge of mercury-contaminated mill tailings to the environment	Mid to Late 1800s
Initial discovery of elevated levels of mercury in the Carson River	Early 1970s
NPL listing (final)	Aug 30 1990
Removal actions	1990, 1992
Human Health Risk Assessment and Remedial Investigation Report	Dec 1994
Feasibility Study	Dec 20 1994
ROD signature	Mar 30 1995
Remedial design start	Apr 5 1995
Remedial design complete	Sep 30 1996
Remedial action start	Sep 30 1996
Superfund State Contract	Jul 1997
Remedial Action construction dates	Aug 1998 – Jan 1999 Aug – Dec 1999
First Five-Year Review Report completed	Sep 2003
Draft Long-Term Sampling and Response Plan (LTSRP) developed	Jan 2005
NDEP finalizes brochure describing development permitting requirements in the Carson River area	Apr 2008

III. Background

The Carson River Mercury Site is east of Carson City, Nevada, and includes more than 50 miles of mercury contaminated river, reservoir, and wetland sediments in the middle and lower portions of the Carson River system, and more than 50 mill sites where mercury was used to process gold and silver ore mined from the "Comstock Lode." The vicinity of the CRMS is shown in Figure 1.

Mining in the Carson River drainage basin commenced in 1850 when placer gold deposits were discovered near Dayton at the mouth of Gold Canyon. Throughout the 1850s, mining consisted of working placer deposits for gold in Gold Canyon and Sixmile Canyon. These ore deposits became known as the Comstock Lode. The initial ore discovered was extremely rich in gold and silver; gold was more abundant in Gold Canyon while silver was more abundant in Sixmile Canyon. The general milling process employed before 1900 involved pulverizing ore with stamp mills, creating a slurry, and adding mercury to the mixture. The mercury formed an amalgam with the precious metals which was then separated from the solution and retorted.

A U.S. Geological Survey (USGS) study first documented elevated levels of mercury in sediment and surface water in the Carson River system in the early 1970s. Subsequent studies further delineated the extent of mercury contamination at historical mill sites, in river and lake sediment, in the adjacent floodplain, and in fish and wildlife. The CRMS was added to the National Priorities List (NPL) on August 30, 1990. The extent of mercury contamination has not been fully delineated at this time. Nevada State Health Division advisories recommend limited or no consumption of fish and ducks at the Site due to high levels of mercury.

EPA has identified two operable units at the Site. OU1, the subject of this FYR, addresses risks posed by the contaminated upland soils, associated with drainages from former mine and mill sites and the floodplain of the Carson River downstream of the drainages. OU2, which is in the Remedial Investigation/Feasibility Study stage, addresses mercury contamination in the Carson River system, including contaminated surface waters and sediments in the Carson River below Dayton, Lahontan Reservoir, Carson Lake and Stillwater National Wildlife Refuge.

The Carson River basin drains approximately 3,980 square miles in east-central California and west-central Nevada. The Carson River forms in the eastern Sierra Nevada Mountains south of Lake Tahoe and generally flows northeastward and eastward to the Carson Sink, a large depressional feature in the Carson Desert with no surficial fluvial outlet. The Carson River flows through a series of generally separate alluvial valleys from the headwaters area to the Carson Sink. In downstream order, the alluvial valleys passed by the River include Carson Valley, Eagle Valley, Dayton Plains, Stagecoach Valley, Churchill Valley, and Carson Desert. Between New Empire and Dayton the River flows through a narrow, high-gradient stretch along which large ore-processing mills were situated in the late 1800s. The flow of the River is interrupted west of Fallon by Lahontan Reservoir, which was constructed in 1915 as part of the

Newlands Irrigation Project. Below Lahontan Dam, flow is routed through a complex network of ditches, drains and canals of the Newlands Irrigation Project. Irrigation return flow eventually discharges to Carson Lake, the Stillwater Wildlife Refuge and/or the Carson Sink.

Stream flow in the Carson River above Lahontan Reservoir is highly seasonal. The major source of water for the Carson River is the winter snow pack in the Sierra Nevada Mountains. Base flow is reached in late summer (August, September, and October) and flow then increases slightly through the fall and winter (November through March), until the snow melt season starts in early spring. Maximum annual flow typically occurs in April, May and June.

The areal extent of water bodies and wetlands in the Carson Basin is highly variable, both seasonally and from year to year. This is especially true in the Carson Desert. For example, between July 1984 and February 1985, following three unusually wet years, the water surface area of the Carson Sink was approximately 200,000 acres; yet by April 1988, during a second consecutive drought year, the sink was dry.

Land and Resource Use

Historical land use in the Carson River basin was mostly agriculture and mining in the 1840s and 1850s. The mining industry and population in the basin fell rapidly in the 1880s; however, railroad access helped promote ranching and farming. Another change in land use was an increase in irrigated acreage in the Carson Desert, prompted by the impoundment of Lahontan Reservoir in 1915 and the creation of the Newlands Irrigation Project. Alfalfa was the principal irrigated crop, in terms of acreage and revenue, in the Newlands Irrigation Project. The estimated irrigated acreage ranged from 61,000 to 67,000 acres for the Newlands Project, from 1980-1987. Dayton and Churchill Valleys, which have the smallest populations in the Nevada portion of the Carson basin, are primarily rangeland, with agricultural areas along the Carson River. Land use and population were relatively unchanged in the Carson River basin from 1890 until 1950, until the advent of suburban development. Since 1950, Carson City and Fallon have grown considerably, with most of the urban and suburban development occurring on land previously used for agriculture. Presently, the local economy and urban land uses are dominated by the retail trade and service sectors, primarily casinos and adjunct businesses such as hotels, motels and restaurants. Areas surrounding the CRMS are expected to continue to experience a high rate of residential growth over the next several decades.

IV. Remedial Actions

Remedy Selection

The selected remedy for OU1 includes the following components:

- Excavation of contaminated soils exceeding 80 milligrams per kilogram (mg/kg) mercury in a limited number of residential areas in Dayton and Silver City; off site disposal of excavated soil and backfilling with clean soil (or placement of up to two feet of clean soil on top of the contaminated soil in lieu of excavation and backfilling); and implementation of ICs if any contamination remains.

- Disposal of soils not exceeding Toxicity Characteristic Leaching Potential (TCLP) standards at a Resource Conservation and Recovery Act (RCRA) municipal landfill.

- Disposal of soils exceeding TCLP standards at a RCRA municipal landfill after treatment, or at a RCRA hazardous waste landfill.

- Restoration and landscaping after excavation and backfilling.

- Implementation of a Long Term Sampling and Response Plan, to ensure that if residential development occurs in areas known or suspected to be impacted by mercury, surface soils will be characterized and, if necessary, addressed.

Remedy Implementation

The four areas of concern where remediation occurred are residential properties designated MS001, MS002, MS004, and MS030. These four areas were remediated as described in the previous section between August 1998 and December 1999. Their locations, shown in Figure 2 for MS001, MS002 and MS004, and Figure 3 for MS030, are as follows:

- *MS001.* This area is in Dayton, bounded by Main Street/Dayton Valley Road to the north, Railroad Avenue to the west, the Carson River to the east and Pradere Road to the south. The approximate size of the remediated area was 92,344 ft^2.

- *MS002.* Located in Dayton, this area is within a mobile home park on the west side of Highway 50, east of Ziller Way. The approximate size of the remediated area was 988 ft^2.

- *MS004.* The third area in Dayton lies along River Street between Silver Street to the north and the Highway 50/River Street junction to the south. The approximate size of the remediated area was 36,603 ft^2.

- *MS030.* Located in Silver City, this area is located west of Highway 342, along American Flat Road. The approximate size of the remediated area was 4,416 ft^2.

Under the LTSRP, NDEP has instituted a review process for proposed developments of five or more residential units or five or more acres. Sewerage plans for these developments require review and approval from NDEPs Bureau of Water Pollution Control. When the Bureau of Water Pollution Control receives a proposed subdivision

plan, it sends a letter to the developer requiring them to coordinate with the NDEP Bureau of Corrective Actions (BCA) on soil sampling for mercury. When NDEP BCA determines the proposed development is within the limits of the CRMS, it requires the developer to perform sampling and, if necessary, remediation consistent with the LTSRP. The BCA maintains a database on the developments and the sampling and remediation information.

V. Progress Since the Last Five-Year Review

The first FYR completed in 2003 found the remedy to be protective:

> *"The remedy at OU 01 currently protects human health and the environment because the excavation and fill work completed as part of the remedial action remains intact and effecting in preventing direct contact with mercury-contaminated soils, protecting human health and the environment in the short term. However, in order for the remedy to be protective in the long-term, efforts to review proposed developments in mercury contaminated areas must continue."*

The 2003 FYR focused on the physical component of the remedial action and did not focus on whether the ICs were in place or how the LTSRP was functioning. Since the first FYR, EPA has developed a nationwide approach to assessing whether ICs in RODs are effective ("Strategy to Ensure Institutional Control Implementation at Superfund Sites," EPA, September 27, 2004). As a result, the second FYR looked closely at the CRMS OU1 ICs.

The following table lists recommendations and follow-up actions from the 2003 FYR.

Table 2 – Site Progress Summary

Issue from previous FYR	Recommendation	Action Taken
MS001 – Flood protection	Monitor Carson River for major flooding and erosion	In 2006 there was a 10,700 cubic feet per second peak flow flood in Dayton and resulting erosion is assumed; however, close inspection of MS001 was not possible during this FYR
Future construction activities in remediated areas	Inspect during next review	Inspection conducted in March 2008 as part of this FYR. No construction evident except scraping of land surface on/near MS004 on Silver St.
Future development in areas with elevated levels of mercury	Continue efforts of NDEP BCA review process	Effort continues; as reported above

VI. Five-Year Review Process

Administrative Components

The team lead for the CRMS FYR was Ms. Jere Johnson, the EPA Remedial Project Manager (RPM) for Region 9. The review team included the following personnel from the USACE, Seattle District: Sheri Moore, Marlowe Laubach, and Jefferey Powers. In November 2007, the review team formed, established the review schedule and identified the major FYR components, including:

- Document Collection and Review
- Data Assessment/Analysis
- Site Inspection
- Interviews and Community Notification and Involvement
- Five-Year Review Report Development and Review

Document Review

Reports pertinent to this FYR were reviewed by the team. The documents reviewed included the Remedial Investigation, Human Health Risk Assessment, Feasibility Study, Record of Decision, the First FYR, and Institutional Control documents including the CRMS brochure, LTSRP, and the NDEP proposed developments data tracking sheet. Attachment 1 is a complete list of documents reviewed during this FYR.

Data Review and Evaluation

The Nevada Division of Environmental Protection has continued to update the LTSRP and any associated ICs. NDEP is tracking new or proposed developments within the CRMS. New residential developments with least five units, or any developments greater than five acres, must submit a Sampling and Analysis Plan to NDEP Bureau of Corrective Actions, if requested. The draft LTSRP provides specific sampling guidelines for assessing, interpreting, and reporting mercury levels in surface soils and specific remediation guidelines for addressing impacted areas, follow-up sampling and reporting (draft LTSRP, 2007).

Between 2003 and 2008, NDEP reviewed 23 development proposals and required mercury soil samples at 13. None of the sampled developments required remediation. Between 1995 and 2003, NDEP reviewed more than 20 development proposals, required mercury soil samples at 12, and remediation at two.

NDEP BCA has worked closely with Lyon County to develop a brochure which describes CRMS mercury contamination to property owners seeking a county building permit, as well as to concerned members of the public. This brochure was approved for publication at a Lyon County meeting in early 2008. See Attachment 5 for the CRMS brochure.

Developers proposing larger-scale developments (five or more residential units or five or more acres) have generated analytical data based on NDEP BCA sampling protocols. NDEP BCA tracks the results in a spreadsheet database. The database tracks development name, project criteria within the CRMS, total acreage and subdivision lots, pre-final-grade sampling, finished-grade sampling, post-remediation sampling and confirmation sampling details.

NDEP summarizes the total number of mercury soil samples and the maximum concentrations. Individual analytical results for each sample location have not been incorporated into the database.

If a proposed development falls within a CRMS area considered to have high potential for mercury contamination, an NDEP-approved Sampling and Analysis Plan (SAP) is prepared for pre-final-grade surface soil sampling (uppermost two feet). If the mercury levels are above 80 mg/kg for residential-zoned property or 300 mg/kg for commercial-zoned property, the developer remediates the area either by capping with two feet of clean fill, or excavating the top two feet and capping with clean fill. The developer collects and analyzes final-grade surface soil samples for mercury to ensure the final-grade soil is acceptable. The process is to be repeated until the final-grade surface soil mercury samples are within acceptable limits.

ARARS Review

Many applicable or relevant and appropriate requirements (ARARs) and To Be Considered (TBC) criteria were pertinent only to the active remedial actions which were completed by December 1999. For example, the *Nevada Bureau of Mining Regulation and Reclamation Guidance Document for Alternate Use of Mine Waste Solids-Disposal Outside of Containment* guidance document was a TBC, which prohibited placement of mine wastes (i.e., potential remedial action excavation material) in an unmanaged disposal facility without proper testing. EPA determined in the ROD that, in the event any of the mine wastes are treated, the test procedures and criteria set forth in this guidance document should apply.

The risk-based cleanup levels for mercury of 80 mg/kg for residential and 300 mg/kg commercial (HHRA, USEPA, 1994) apply to the CRMS as an enforceable requirement. Because the *Nevada Contaminated Soil and Groundwater Remediation Policy*, although not promulgated, contained soil cleanup standards deemed TBC, and because EPA determined an absence of other promulgated standards, the cleanup standards in this State policy were applied to the CRMS. The policy states that site-specific cleanup levels may be used in place of those set forth in the policy if the site-specific levels are developed in accordance with a scientifically valid risk assessment; hence the site-specific 80 and 300 mg/kg cleanup levels are used. See Attachment 2 for a summary table of ARARS identified in the ROD for this Site.

Site Inspection

A site visit and inspection was conducted March 3-6, 2008. This included a meeting with personnel at the NDEP BCA in Carson City and ICs research at the Lyon County Recorders Office in Yerington, on March 4th. A meeting with the Lyon County Building Manager at a satellite office was held in Dayton. The formal site inspection of remediated sites MS001, MS002, MS004, and MS030 was conducted on March 5th in Dayton and Silver City. One of the development projects currently under construction was visited. The review team visually inspected and documented conditions at the remediated areas and the surrounding areas. Representatives of the USACE and NDEP were present for the site inspection. For additional details regarding the site inspection and findings, including photographs of select features and a roster of attendees, see the Site Inspection Trip Report (Attachment 3) and Site Inspection Checklist (Attachment 4).

The site inspection indicated that the remedial actions at the three locations in Dayton and one in Silver City remain protective, because no significant soil disturbance was observed. One exception was at MS004, south of Silver Street in Dayton, where scraping of the land surface by a front-end loader or equivalent was evident. There were somewhat recently created piles of soil mounded adjacent to flat parking areas at this location. See Attachment 4 for a discussion of implications of this finding.

Interviews

As part of the site visit and inspection process, three informal interviews were conducted. The first two interviewees were from the NDEP Bureau of Corrective Actions: Mr. Jeryl Gardner, Environmental Scientist, and Mr. Samuel Jackson, Supervisor, Superfund Branch. These individuals provided site history and updated information on the Site's ICs status. Mr. Nick Malarchik, Department Director of the Lyon County Building Department, was also informally interviewed during the meeting between the FYR team and the NDEP personnel. Mr. Malarchik provided the County's perspective of the remedy and relayed concerns of Lyon County residents. No formal interviews were conducted as part of the second FYR. Refer to Attachment 4 for interview details.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The excavation and fill work associated with all but a portion of one remediated area appears intact and effective in preventing direct contact with mercury-contaminated soils. ICs for remediated parcels have not been implemented. ICs for developments under the LTSRP are being implemented; however, information on ICs for these properties is not readily accessible by current or future property owners, users or developers. There is also a smaller subset of developments that are not captured by

the sewerage permitting process which trigger the ICs review for the larger developments.

Remedial Action Performance and Monitoring Results:

After soil removal and clean fill replacement was completed, the remediated areas were reseeded with native vegetation (MS001, MS004, MS030), or sodded (MS002 and portions of MS004). A temporary irrigation system was put in place at MS0001 to establish vegetation and permanent irrigation systems were replaced for portions of MS004. There is currently no monitoring for breach of the clean surficial soil, other than once every five years during the FYR site inspection. A breach might result in potential exposure to subsurface soils with mercury above the 80 mg/kg or 300 mg/kg cleanup levels. An example of a potential breach of the remedy was observed during the site inspection at MS004, south of Silver Street in Dayton, where the land surface appeared to have been scraped to provide possible vehicle parking.

The reported frost penetration depth in north central Nevada is approximately 18 inches (Lyon County Building Department, personal communication). Most excavations for shallow construction (i.e., decks, fences, above ground swimming pools, mailbox posts, etc.) are not deeper than the two feet of clean fill in remediated areas. Any major construction projects requiring excavation below two feet in the four remediated areas (i.e., in-ground swimming pools, housing additions, etc.) would need to be addressed through the LTSRP ICs program.

System Operations and Maintenance:

No active, ongoing remedial system was required in the Record of Decision after the excavation and fill component of the remedial action was completed. As part of an inspection program, such requirements might be developed.

Early Indicators of Potential Remedy Problems:

The current mechanism in place to monitor potential remedy problems is during the site inspection for each FYR. Based on visual observation during this FYR site inspection, only one of the four remediated sites indicated of a potential problem. There is currently no mechanism for post-remediation site inspections of the areas remediated under the LTSRP provisions for new subdivisions. As described below, gaps in ICs implementation are also considered potential remedy problems.

Implementation of Institutional Controls and Other Measures:
The following ICs were described in the ROD.

- *Remediated areas:* Deed or construction restrictions that prevent disturbance of subsurface mercury remaining on site and/or health and safety measures for the protection of onsite workers and residents during any future subsurface construction.

- *Areas that may be developed:* Use of an IC implementation document, referred to as the Long-Term Sampling and Response Plan, to ensure that any residential development in areas known or suspected to be impacted by mercury include investigation and if needed remediation.

This FYR concluded that ICs for the four initial remediated areas have not been implemented. Because subsurface soil sampling was not conducted at the same frequency as surface soil sampling, it is not clear whether residual subsurface soil contamination that could pose a risk if disturbed, is present or not.

EPA sent letters to the owners of some of the parcels in the four remediated areas in August 2000, which stated:

> *"We believe that the removal of contaminated soil and placement of clean fill have eliminated the human health risks associated with mercury-contaminated soil at your property."*

And,

> *"...soils below those excavated were not analyzed or removed, but do not present a (any) current health risk because of the limited potential for direct contact with them..."*

The letters included recommendations for reburying and/or covering[1] and/or soil analysis if the soils below the remediated zone are exposed or otherwise disturbed[2].

The FYR team visited the Lyon County Recorders Office in Yerington. The purpose of the visit was to determine: 1) what institutional control information related to the CRMS was recorded at the County, and; 2) what the procedure would be for a homeowner or prospective buyer to gather information about a property in the CRMS. During the site visit, the FYR team obtained parcel numbers from the County Assessors Office, to look up in the County Recorder's Office. No deed notices or restrictions were found in any of the sample parcel records reviewed, for the remediated areas.

The LTSRP has been drafted, but not finalized. Several concerns have been identified that need to be addressed before the LTRSP is adopted by NDEP and EPA.

- The CRMS boundaries have not been well defined and there is no clear method for determining whether a property is within or outside of the CRMS.

- The LTSRP provides a permitting trigger for sampling and remediation of individual properties or developments of five or more acres or with five or more

[1] Note: specifying with two feet of fill in letters to two parcels
[2] Note: one parcel was remediated to one-half foot below grade; the others were remediated to two feet below grade

residential units. However, no mechanism is in place for smaller developments and properties.

- The durable notification mechanism (DNM) efforts are not as developed as the sampling and remediation requirements in the LTSRP. Environmental covenants (ECs), covenants, conditions and restrictions (CC&Rs), and technical documents are not recorded at the Lyon County Recorder's Office consistently, for the properties that have been remediated through the LTSRP. Institutional Control information is not readily available by individual parcel number.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?

The exposure assumptions, toxicity data, cleanup levels, risk assessment methods and remedial action objectives used at the time of remedy selection in 1995 are still valid. The 80 mg/kg residential and 300 mg/kg commercial risk-based cleanup levels for mercury are still valid for the CRMS.

The derivation of site-specific cleanup levels for mercury included the assumption based on analytical results that 90 percent of mercury in soil was either elemental mercury or mercuric sulfide, and the other 10 percent was soluble mercuric chloride. No sampling data, research data or other information has come to light which might alter the percentages used in risk calculations.

Toxicity information provided in the HHRA has changed. Toxicity values published in the Integrated Risk Information System (IRIS) have undergone re-evaluation and have changed for arsenic and mercury. (Table 3 provides the toxicity values used in the risk assessment and current values provided in IRIS.) The changes in the slope factor and organic mercury are slight and still within EPA's risk range; and therefore, do not affect protectiveness.

Table 3 – Toxicity Value Comparison

COC		Reference Dose (oral) (mg/kg-day)$^{-1}$	Reference Dose (inhalation) (mg/kg-day)$^{-1}$	Slope Factor (oral) (mg/kg-day)$^{-1}$	Slope Factor (Inhalation) (mg/kg-day)$^{-1}$	Source
Arsenic	HHRA	0.0003	-	1.75	15	IRIS
	Current	0.0003	-	1.5	-	IRIS
Elemental Mercury	HHRA	-	0.0003	-	-	HEAST
	Current	-	0.0003	-	-	IRIS
Organic Mercury (methyl-Hg)	HHRA	0.0003	-	-	-	IRIS
	Current	0.0001	-	-	-	IRIS

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy is not fully functioning as intended by the ROD. The soil removal and replacement portion of the remedy for the four remediated sites is functioning as intended, by eliminating direct exposure to the known mercury contaminated soil. However, ICs are not in place for the four remediated areas, to prevent exposure or disturbance of potential residual mercury contamination. The draft Long-Term Sampling and Response Plan does not include ICs that address residential developments less than five units or developments less than five acres. The durable notification mechanisms (DNM) are not being recorded at the Lyon County Recorder's Office consistently for the properties that have been remediated through the LTSRP. It is difficult to find DNM information by individual parcel at the Recorder's office.

There has been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there have been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

VIII. Issues

Table 4 – Issues of the 2008 Five-Year Review

Issue	Affects Protectiveness? (Y or N)	
	Current	Future
1. The CRMS boundaries are not well defined to focus on the areas of concern; the LTSRP does not address developments of less than five residential units or less than five acres; the LTSRP is still a draft document; ICs for properties remediated under the LTSRP are not readily accessible by individual parcel number to current or future property owners, developers or users.	Y	Y
2. ICs have not been implemented in the four areas remediated in 1999, to prevent disturbance of subsurface soils which may contain mercury above cleanup levels. There is no routine inspection program other than the FYR review.	Y	Y

IX. Recommendations and Follow-up Actions

Table 5 – Recommended Follow-Up Actions

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Planned Completion Date
1a. The CRMS areas of concern are not well defined. 1b. There is no IC trigger for developments less than five residential units or than five acres. 1c. The LTSRP is still a draft document 1d. Information on ICs for properties is not readily accessible.	1a. Improve CRMS boundary maps to better define areas of concern	NDEP/USEPA	USEPA	Sept 2010
	1b. Revise the LTSRP to address developments less than five residential units or than five acres	NDEP	USEPA	Dec 2009
	1c. Adopt a final LTSRP	NDEP	USEPA	Dec 2009
	1d. Work with Lyon County to assure that ICs information for properties is accessible to current and future property owners, users and developers.	NDEP/USEPA	USEPA	Dec 2009
2. Implement appropriate ICs to prevent exposure to mercury above cleanup levels at areas remediated in 1999. Perform periodic inspection of remediated areas.	Work with NDEP and Lyon County to develop and implement appropriate ICs for the four remediated areas and an inspection program.	USEPA	USEPA	Sep 2009

X. Protectiveness Statement(s)

The remedy at the Carson River Mercury Site OU1 is not protective of human health and the environment because the ICs for the four properties remediated under the ROD are not in place and information on the recorded ICs for properties covered under the LTSRP is not readily accessible. In addition, a category of properties (developments smaller than five residential properties or five acres) does not have an ICs trigger mechanism. The soil removal and replacement element of the ROD was implemented

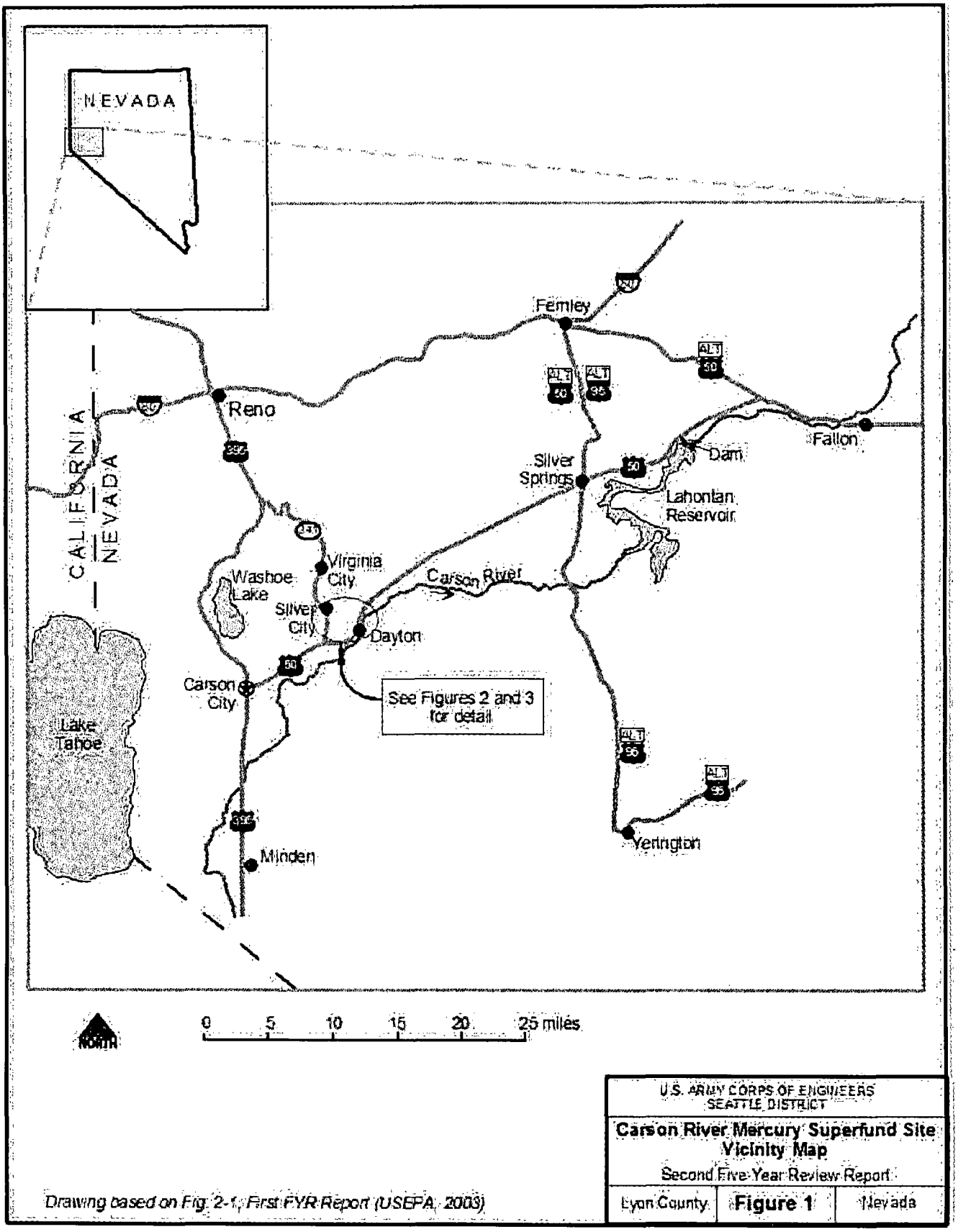
as planned and the sampling and remediation aspects of the LTSRP are operating as intended for developments five or greater residential properties or five or greater acres.

XI. Next Review

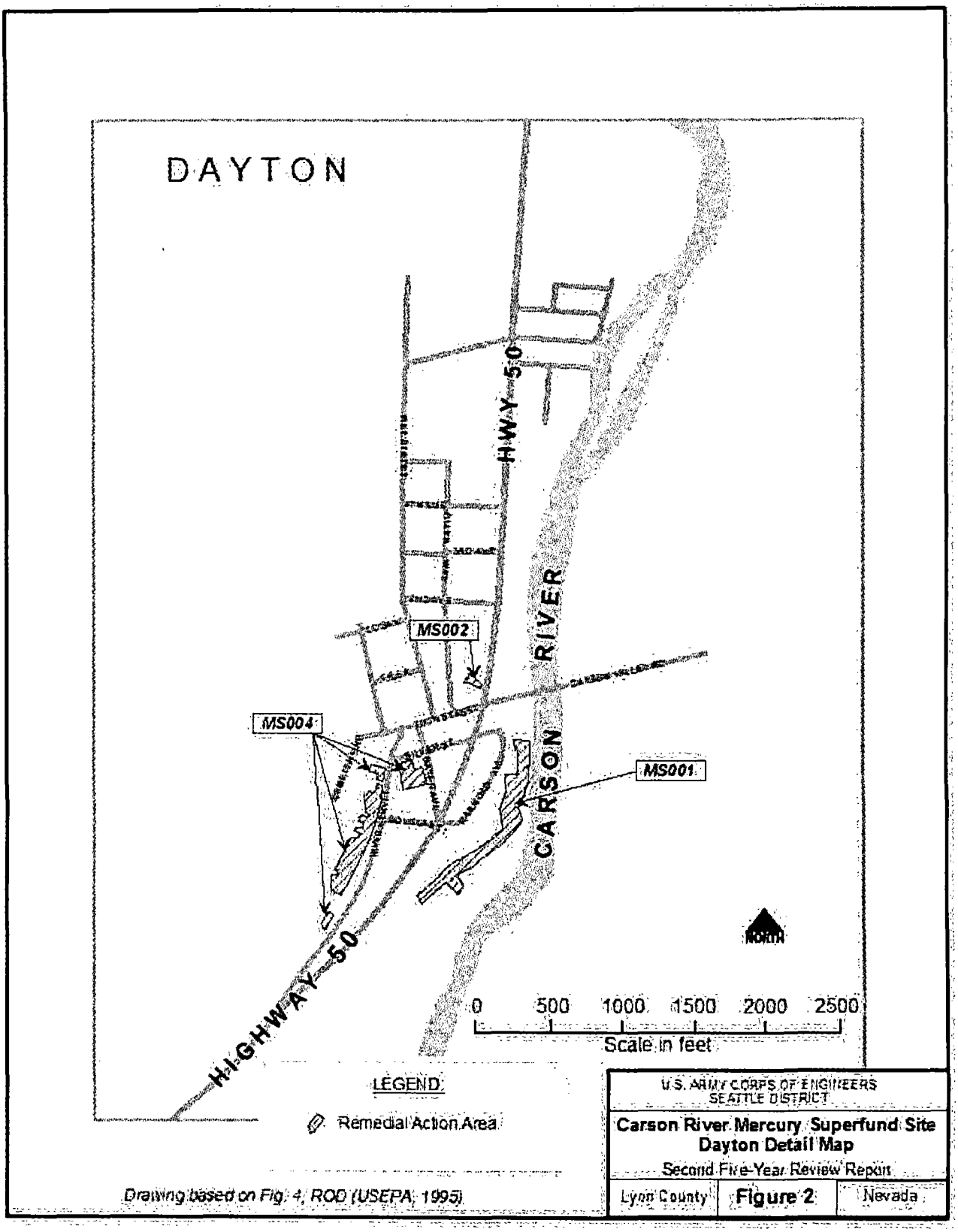
The next FYR for the Carson River Mercury Site is required by September 2013, five years from the signature date of this review.

Figures

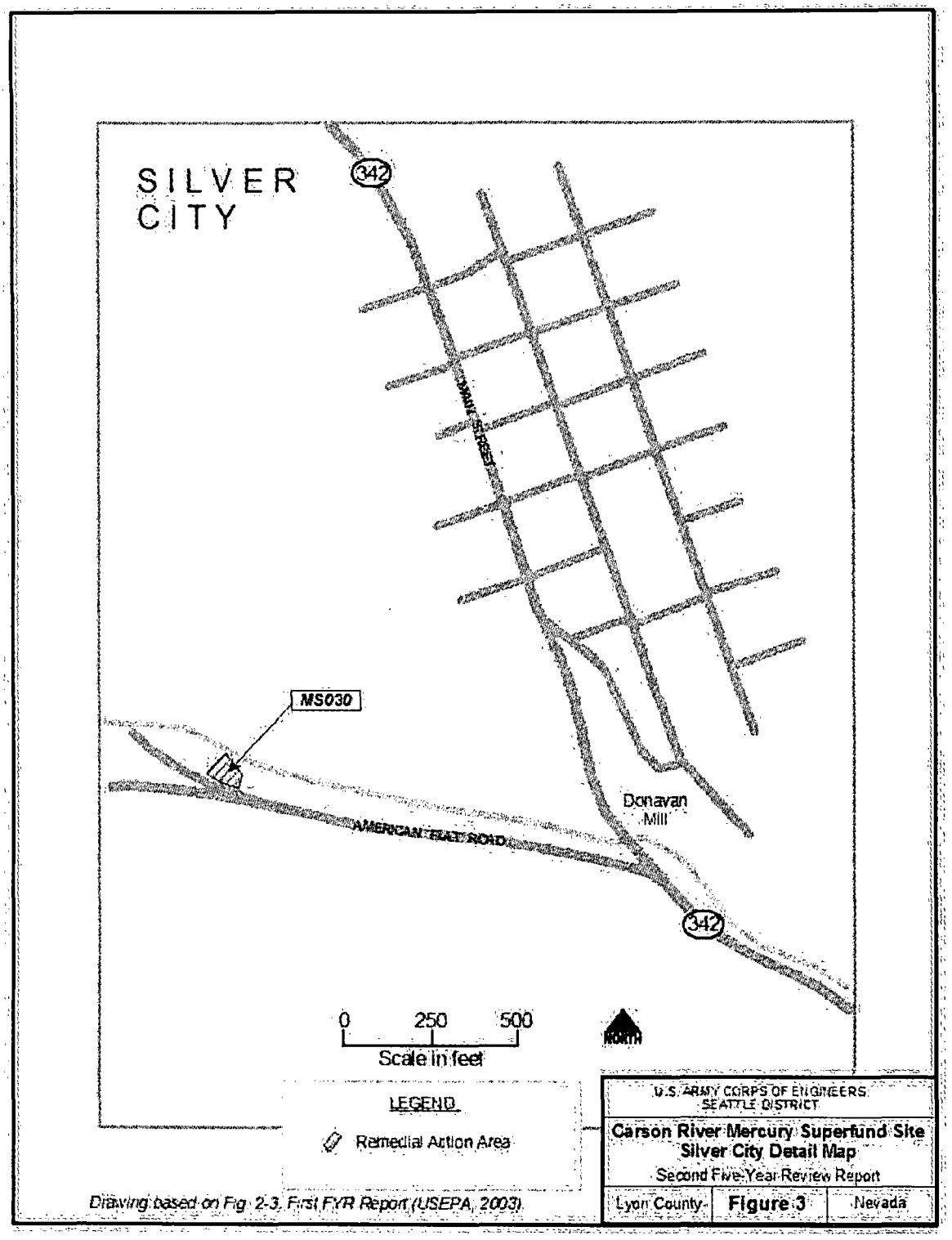
[This page intentionally blank]


NEVADA
CALIFORNIA
NEVADA
Fernley
Reno
Fallon
Silver Springs
Lahontan Reservoir
Dam
Virginia City
Washoe Lake
Silver City
Carson River
Dayton
Carson City
Lake Tahoe
Minden
Yerington
See Figures 2 and 3 for detail
NORTH
0 5 10 15 20 25 miles
U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
Carson River Mercury Superfund Site
Vicinity Map
Second Five-Year Review Report
Lyon County
Figure 1
Nevada
Drawing based on Fig. 2-1, First FYR Report (USEPA, 2003)

[This page intentionally blank]


DAYTON
HWY 50
CARSON RIVER
MS002
MS004
MS001
HIGHWAY 50
NORTH
0 500 1000 1500 2000 2500
Scale in feet
LEGEND
Remedial Action Area
Drawing based on Fig. 4, ROD (USEPA, 1995)
U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
Carson River Mercury Superfund Site
Dayton Detail Map
Second Five-Year Review Report
Lyon County
Figure 2
Nevada

[This page intentionally blank]


SILVER CITY
342
MAIN STREET
MS030
AMERICAN FLAT ROAD
Donavan Mill
342
0
250
500
Scale in feet
NORTH
LEGEND
Remedial Action Area
U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
Carson River Mercury Superfund Site
Silver City Detail Map
Second Five-Year Review Report
Lyon County
Figure 3
Nevada
Drawing based on Fig. 2-3, First FYR Report (USEPA, 2003)

Attachment 1

List of Documents Reviewed

LIST OF DOCUMENTS REVIEWED

Ecology and Environment, Inc. (E&E, Inc.), 1994. Feasibility Study, Carson River Mercury Site. Dec 1994. Prepared for USEPA.

E&E, Inc., 2000. Remedial Action Report, Carson River Mercury Site, Operable Unit 1 – Surface Soil, Dayton and Silver City, Nevada. May 2000. Prepared for USEPA.

E&E, Inc. and Haddan Engineering, various dates. Various oversize Remedial Action drawings (unpublished?).

Nevada Division of Environmental Protection (NDEP). [Draft] Carson River Mercury Superfund Long-Term Sampling and Response Plan (LTSRP), Risk-Assessment and Management Guidelines. Date unknown. Prepared for USEPA Region 9.

NDEP and Lyon County. 2008. Carson River Mercury Site Brochure. Apr 2008.

NDEP. Carson River Mercury Site LTSRP Sampling and Action Tracking Database (unpublished). Date unknown.

Singh, A., 1995. Draft Geostatistical Analysis of Mercury Concentrations in Soils of Dayton, Nevada for the Carson River Superfund Site. Mar 1995. Prepared for Lockheed Environmental Systems & Technologies, Las Vegas.

US Environmental Protection Agency (USEPA), 2003. First Five-Year Review Report for the Carson River Mercury Site, Dayton and Silver City, Lyon County, Nevada. Sep 2003.

USEPA, 1995. Record of Decision for Carson River Mercury Site, West Central Nevada, Operable Unit 1: Surface Soil. Mar 1995.

USEPA, 1994. Revised Draft Human Health Risk Assessment and Remedial Investigation Report, Carson River Mercury Site. Dec 1994.

[This page intentionally blank]

Attachment 2

Review of ARARs

[This page intentionally blank]

ARARs Review Summary, Carson River Mercury Site

Medium	Source/ARAR	Applicable or Relavant and Appropriate	Requirement Synopsis	Initial Comment on Application	Current ARAR Evaluation
Action-Specific ARARs					
Soil	Resource Conservation and Recovery Act (RCRA)	Not Applicable	RCRA requirements exempted because Bevill amendment (exempting mining wastes from definition of hazardous waste) applies	EPA has determined that excavated wastes that exceed the mercury standards for the TCLP text (i.e., TCLP exceeds 0.2 mg/l) will be either treated and disposed at a municipal landfill, or disposed at a hazardous waste landfill.	This ARAR is still not applicable for this Site. Should excavated soils exceed mercury standards for TCLP, these material shall be treated and disposed in a municipal landfill or disposed in a hazardous waste landfill.
Soil (dust)	Nevada Administrative Code §445.734 (Fugitive Dust Emissions)	Applicable	Requires handling, transporting or storing of any material be performed in a manner which does not allow controllable particulate matter to become airborne	Excavation of mercury-contaminated soils to comply with this regulation	This ARAR is still applicable for this Site.
Location-Specific ARARs					
Soil	Executive Order No. 11988; 40 CFR §6.302(b); 40 CFR Part (Appendix A)	Applicable	Actions shall be taken to reduce the risk of flood loss within the 100-year flood plain	Remedial actions within the Carson River 100-year flood plain are to be performed in a manner that it does not increase the risk of flood loss	This ARAR is still applicable.
Soil	Executive Order No.	Potentially	Requires Federal	MS001 adjacent to	This ARAR is still

Medium	Source/ARAR	Applicable or Relavant and Appropriate	Requirement Synopsis	Initial Comment on Application	Current ARAR Evaluation
	11990 on Protection of Welands	Applicable	agencies to avoid, to the extent possible, adverse impacts associated with the destruction or loss of wetlands	Carson River, although no known designated wetlands were identified	applicable should wetlands be affected.
Soil	Clean Water Act §404; 40 CFR Part 230; 33 CFR Part 320-330	Potentially Applicable	These requirements protect wetlands by prohibiting the discharge of dredged or fill material without a permit	MS001 adjacent to Carson River, although no discharges of this type were planned or conducted	This ARAR is still potentially applicable should discharges of this nature are planned or conducted.
Soil	Archaelogical and Historical Preservation Act, 16 USC §469, 40 CFR §6.301(b) and (c)	Potentially Applicable	Establishes procedures to preserve historical and archaeological data which might be destroyed through alteration of terrain as a result of Federal activity	No known historical or archaeological impacts encountered	This ARAR is still applicable should archaeological or historical data be encountered.
To Be Considered (TBCs)					
Soil	*Nevada Contaminated Soil and Groundwater Remediation Policy* (Jun 25, 1992)	Cleanup Level	Policy states cleanup level for mercury to be 20 mg/kg unless a site-specific risk assessment determines otherwise	CRMS HHRA (EPA, 1994) determined cleanup levels for mercury at 80 mg/kg residential and 300 mg/kg commercial. This risk-based standard is applicable for the Site.	The EPA risk-based standard is still applicable for the site
Soil	*Nevada Bureau of Mining Regulation and Reclamation Guidance Document for*	TBC	Ensures mine wastes are not placed in an unmanaged disposal facility. If TCLP not met,	Applied to high-mercury soils excavated from MS001, MS002,	This TBC is still applicable

Medium	Source/ARAR	Applicable or Relavant and Appropriate	Requirement Synopsis	Initial Comment on Application	Current ARAR Evaluation
	Alternate Use of Mine Waste Solids – Disposal Outside of Containment (May 3, 1994)		then material must be treated before disposal at a RCRA municipal landfill, or else disposed at a RCRA hazardous waste landfill	MS004, MS030	

Note:
ARARS summary based on discussion of ARARS in Record of Decision (EPA, 1995), Section 9.2.2.

[This page intentionally blank]

Attachment 3

Site Visit/Trip Report, with Photographs

[This page intentionally blank]

TRIP REPORT
CARSON RIVER MERCURY SITE, CARSON CITY, NV
(EPA ID: NVD980813646, Region 9)

---

1. INTRODUCTION

a. Dates of Visit: 3-6 Mar 2008
b. Location: Carson City, NV; Dayton and Silver City, Lyon County, NV
c. Purpose: This site visit was conducted to meet the needs of the five-year review (FYR).
d. Travelers:

Ms. Sheri Moore, US Army Corps of Engineers, Seattle District, (206) 764-3467
Mr. Jefferey Powers, US Army Corps of Engineers, Seattle District, (206) 764-6586

e. Contacts:

Mr. Jeryl Gardner, Nevada Division of Environmental Protection, (775) 687-9385
Mr. Sam Jackson, Nevada Division of Environmental Protection, (775) 687-9381
Mr. Nick Malarchik, Lyon County Building Department

2. SITE VISIT SUMMARY

Ms. Moore and Mr. Powers ("USACE team") arrived in Reno, NV the morning of 3 Mar 2008 via air travel from Seattle, WA. The USACE team drove from Reno to Carson City by way of a route through Virginia City. Virginia City was visited by the team to gain historical perspective of the Carson River Mercury Site (CRMS). Virginia City was the main hub of activity during the Comstock Mining era, primarily from 1860 to 1900. It was during that time that the processes that caused the contamination being dealt with under the CRMS Superfund Site was in use and releasing mercury into the environment. The USACE team spent some time looking at the town, the surrounding mine sites and remaining tailings piles, and then drove through another historical town, Silver City. Silver City was important to visit because one of the sites remediated during the 1999 remedial action is located in Silver City. The USACE team attempted to visit the site, but a lack of road signs prevented the team from knowing if they were on the right street. The team then drove through Dayton, another town within the CRMS, on their way to Carson City. The team did not attempt to locate the remediation sites in Dayton without the support of the NDEP team.

On Tuesday, 4 Mar 2008, the USACE team met with Mr. Jeryl Gardner and Mr. Sam Jackson of the Nevada Division of Environmental Protection (NDEP) Bureau of Corrective Actions (BCA) at 09:00 to begin discussions on the CRMS. Mr. Gardner is very knowledgeable on the Site and was helpful to the USACE team by describing the history and the institutional controls (ICs) to date. The USACE team spent approximately three hours with Mr. Gardner discussing the site history and current conditions. In the afternoon, the USACE team drove to Yerington in Lyon County. Yerington is the county seat for Lyon County; the main county of the CRMS. The purpose of the trip to Yerington by the USACE team was to visit the County Assessor's and

Recorder's office to conduct research on Site ICs. The trip to Yerington took from approximately 13:00 to 18:00.

On Wednesday, 5 Mar 2008, the USACE team met with the NDEP team to (1) meet with the Lyon County Building Manager, Mr. Nick Malarchik, to discuss ICs, and (2) to conduct the five-year review (FYR) site visit. The team met with Mr. Malarchik at the Lyon County satellite office in Dayton at 10:00. As the Lyon County Building Manager, Mr. Malarchik has been working with the NDEP on a brochure that is intended to be provided to property owners who require building permits from Lyon County. The site visit team (USACE and NDEP teams) discussed the status of the brochure, necessary steps to get it released, and possible outcomes once the brochure is available. More formal ICs were also discussed. After spending approximately one hour with Mr. Malarchik, the site visit team began visiting the remedial sites. The site visit team visited remedial action sites MS004, MS001, and what was thought to be MS002 in Dayton, and then after lunch, MS030 in Silver City. The team also reconnoitered Santa Maria Ranch, which is one of the new housing developments along the Carson River on property that once contained a mill site. Mr. Gardner and Mr. Jackson talked about soil sampling for mercury, the sampling results, and actions taken by the developer to get the property ready for residential use. After visiting Santa Maria, the site visit team headed back to the NDEP office in Carson City to look at NDEP records for additional information not in the Superfund Record Index that the USACE team had as a reference. During the record review, the team realized that the location for MS002 was not consistently shown on different maps. The USACE team took the information from pre-remediation drawings, RI figures, and the RA Report figures and went back to Dayton to find the right MS002 location. Based on the greatest number of referenced features, it appears that the location of MS002 shown in the RI figures is correct. The USACE team returned to their hotel by 17:30.

On Thursday, 6 Mar 2008, the USACE team drove from Carson City, NV to Reno to fly back to Seattle. The team returned their rental car and was at the airport by 08:30 for their 10:40 flight. The USACE team returned to Seattle at 13:00 with the site visit completed.

3. DISCUSSION

The Carson River Mercury Site (CRMS) is a USEPA-led CERCLA site for which a FYR is being conducted with technical assistance from Seattle District USACE. This FYR is the second FYR for the CRMS. The first FYR was completed in Sep 2003; the second is scheduled for completion in Sep 2008. The trip to Carson City and the surrounding area was made to conduct the site inspection and complete the Site Inspection Checklist components of the FYR. Furthermore, the site visit was necessary in providing the USACE technical team the opportunity to become more familiar with the CRMS, the remedial actions implemented, and the ICs, an important part of the site remedy.

Institutional Controls

The ICs for this Site are continually being developed and updated to meet the intention in the ROD. The ROD calls for a Long-Term Sampling and Response Plan (LTSRP) to be developed by EPA Region 9 that includes all the ICs for the Site. To date, the LTSRP has not been finalized. The NDEP has been tasked by EPA Region 9 to initially develop the LTSRP based on their local site knowledge and proximity to other local authorities critical for the implementation of any IC. The NDEP has been working internally to extend ICs to the maximum of their ability. NDEP has also been working with Lyon County to expand the informational aspect of ICs to allow the public to understand what the potential mercury-related risks may be. The USACE team spent time with NDEP to understand what the current ICs are, how they can be tracked by regulatory agencies and the public, and what direction the ICs and LTSRP are headed in the future. Details on the outcome of these discussions, the research at the Lyon County Assessors and Recorders offices, and the visit to Santa Maria Ranch are presented in the IC memo, Attachment 6 of the FYR. The site visit was instrumental in providing sufficient information for the USACE team to be able to properly document the current status of ICs in the FYR.

Remediated Sites

The team visited the four sites remediated as part of the remedial action required in the ROD. No property owner was disturbed during the site visit and private property was not intruded upon. MS001 was viewed at a distance by driving along Railroad Avenue in Dayton. Since MS001 is located on private property behind residences along Railroad Avenue and adjacent to the Carson River, an in-depth assessment of conditions at this site could not be made. A flood event of the Carson River system reportedly occurred in Jan 2007 and may have eroded portions of MS001. Overall, there does not appear to be significant changes to the remediated areas viewed that may cause the remedy to not be protective. However, there have been some activities adjacent to MS004 that caused the team to question the possible extent of the remedy and what lengths are reasonable after the action. At MS004, the adjacent property is a mini-mart that, based on the team's interpretation of the site, recently re-graded and put down new gravel in their driveway. The soil graded from the mini-mart has been pushed up into piles along the sidewalk adjacent to the remediated public land and next to the remediated residential land.

Overall

This change in site condition at MS004 could cause the previously remediated areas to be recontaminated with mercury-containing soils. However, at this point, the team was not able to assess whether the graded materials were in an area that had high levels of mercury, it's more of a question of what would EPA do to continue to ensure that those four areas remain below the residential level. And of course, this question could extrapolate out to the larger site, as well. The CRMS is a very large area with just as large number of property owners who are able to do with their property what they wish. The question to be answered by a FYR is whether the remedy remains protective. But at this site, by what mechanism can EPA ensure protectiveness given the large and unknown extent of mercury surface and subsurface contamination in

Operable Unit 1? This remains a difficult and complex question to address and an assessment of protectiveness is difficult given the aforementioned site challenges.

Ms. Sheri Moore
Chemical Engineer
CENWS-EC-TB-ET

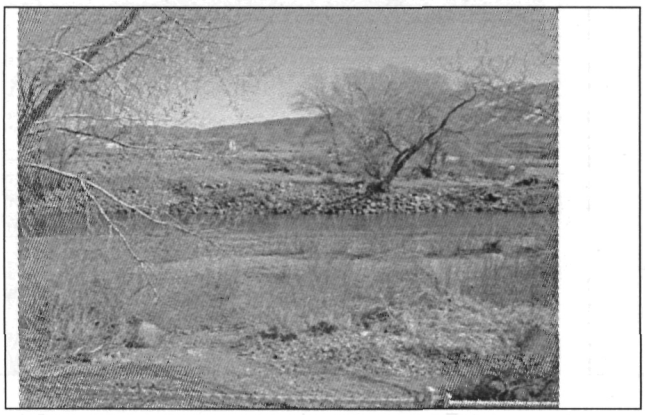


Photo 1. Northernmost end MS001 (Dayton).

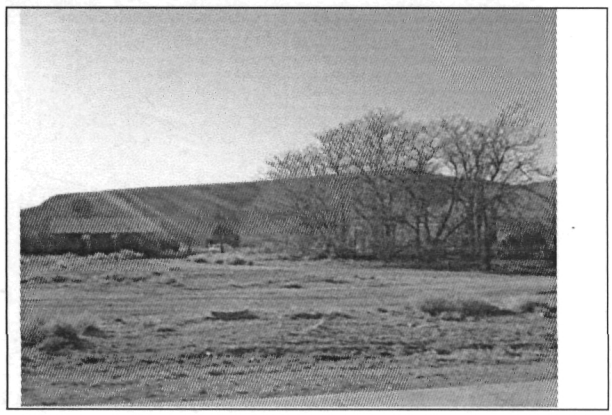


Photo 2. Most probable MS002 (Dayton) location.

Photo 3. Dayton public park at southernmost end of MS004.

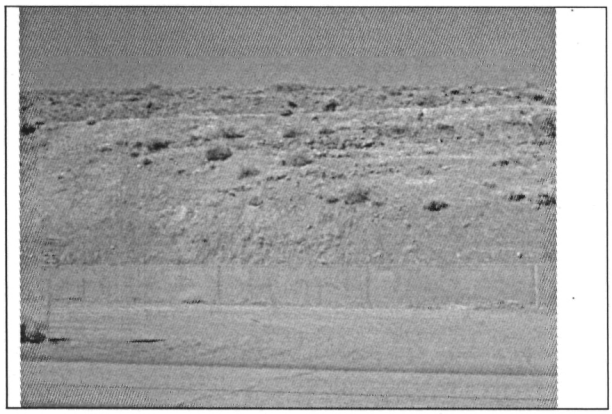


Photo 4. Minor erosion of slope behind retention wall, southern end of MS004.

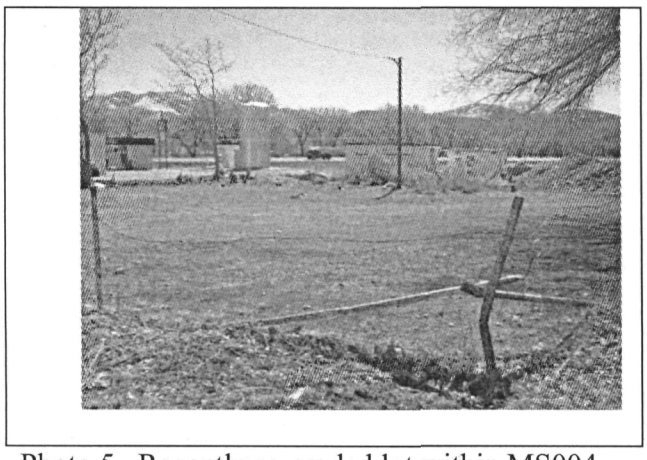


Photo 5. Recently re-graded lot within MS004.

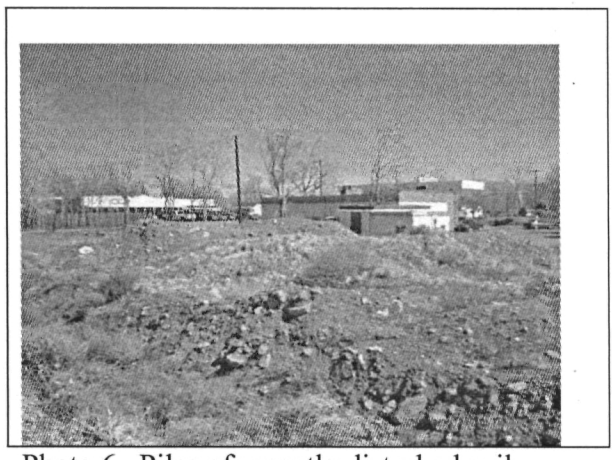


Photo 6. Piles of recently disturbed soil adjacent to re-graded lot, MS004.

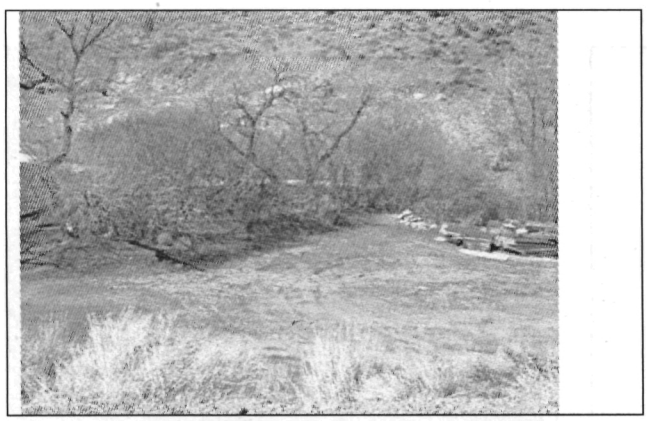


Photo 7. MS030 (Silver City) from American Flat Road.

Photo 8. Undeveloped lots of Santa Maria Ranch, Dayton, NV.

Attachment 4

Site Inspection Checklist

[This page intentionally left blank]

Site Inspection Checklist

I. SITE INFORMATION

Site name: Carson River Mercury Site	**Date of inspection:** 05 Mar 2008, 11:00 – 4:30
Location and Region: Carson City, NV, Region 9	**EPA ID:** NVD980813646
Agency, office, or company leading the FYR: US Army Corps of Engineers for EPA Region 9	**Weather/temperature:** Sunny, windy w/ no clouds; 45 degrees Fahrenheit

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other: Past removal and/or capping of surface soils contaminated with mine tailings from the Comstock Mine era.

Attachments: ☒ Inspection team roster attached ☐ Site map attached

Inspection team: Jeryl Gardner and Samuel Jackson (NDEP); Sheri Moore and Jefferey Powers (USACE)

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** ☒ N/A

2. **O&M staff** ☒ N/A

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Nevada Division of Environmental Protection (NDEP)
Contact Jeryl Gardner | Environmental Scientist | 03/05/08 | 775-687-9385
Name | Title | Date | Phone no.
Problems; suggestions. ☒ Report attached
The IC attachment to the FYR contains comments and suggestions from Mr. Gardner of the NDEP.

Agency NDEP
Contact Samuel Jackson | Supervisor, Superfund Branch | 03/05/08 | 775-687-9381
Name | Title | Date | Phone no.
Problems; suggestions. ☒ Report attached
The IC attachment to the FYR contains comments and suggestions from Mr. Jackson of the NDEP.

Agency Lyon County Building Department
Contact Nick Malarchik | Department Director | 03/05/08 | 775-463-6591
Name | Title | Date | Phone no.
Problems; suggestions. ☒ Report attached
The IC attachment to the FYR contains comments and suggestions from Mr. Malarchik of the NDEP.

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☐ O&M manual — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ As-built drawings — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Maintenance logs — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

2. **Site-Specific Health and Safety Plan** — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

3. **O&M and OSHA Training Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

4. **Permits and Service Agreements**
   - Air discharge permit — ☐ Readily available — ☐ Up to date — ☒ N/A
   - Effluent discharge — ☐ Readily available — ☐ Up to date — ☒ N/A
   - Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☒ N/A
   - Other permits _____ — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

7. **Groundwater Monitoring Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

9. **Discharge Compliance Records**
   - Air — ☐ Readily available — ☐ Up to date — ☒ N/A
   - Water (effluent) — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ☒ N/A

    Remarks _____

IV. O&M COSTS ☒ N/A

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks The site is too large to designate fencing as a control and none of the remediated areas had fencing to protect the remediated area.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
Remarks _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A
Remarks: The ICs program is a work in progress for the site, so an evaluation of whether they are being properly implemented is not applicable. The NDEP is developing, with EPA Region 9, the Long-Term Sampling and Response Plan (LTSRP) that outlines the ICs for the site. The ICs to date primarily apply to land developments with 5 or more homes which must go through the NDEP for approval, which includes analysis of whether any of the development is in an area of concern and, if so, then the sampling plan for remediation must be submitted and approved by NDEP.
Type of monitoring (*e.g.*, self-reporting, drive by) Monitoring of developments containing five homes or more is overseen by the NDEP.
Frequency: Each time a developer submits plans to the NDEP Bureau of Water Pollution Control, they become involved in the IC program via the NDEP Bureau of Corrective Actions.
Responsible party/agency: The NDEP is the implementing agency for ICs.

Contact: Jeryl Gardner	Environmental Scientist	03/05/08	775-687-9385
Name	Title	Date	Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A
Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☒ Report attached
Remarks While the ROD does specify that deed restrictions be implemented as part of the remedy, the ROD does not specify how those will be implemented, where they apply, and who is to initiate the restrictions.

2. **Adequacy** ☐ ICs are adequate ☒ ICs are inadequate ☐ N/A
Remarks: The ICs to date are not adequate to address every potential property that may be impacted by or within the CRMS. The scope of such ICs may be too difficult to implement. The progress of IC implementation is going well and may even improve more as programs are successfully developed.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☐ No vandalism evident ☒ N/A
Remarks _____

2. **Land use changes on site** ☐ N/A
Remarks: Changes in land use were checked at the remediated areas. All did appear to remain as residential areas.

3. **Land use changes off site** ☐ N/A

Remarks: Land use changes off site primarily consist of property developments in areas formerly used for ranching or which were undeveloped. These areas with developments of 5 or more homes are part of the IC system; developments w/ 4 homes or fewer are not directly part of the IC system. NDEP is working w/ Lyon County Building Department to educate property owners on the possibility of their property being in the CRMS and to contact NDEP if they have concerns.

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

B. Other Site Conditions ☐ N/A

Remarks:

Site conditions were reviewed for the four locations that had undergone remediation in 1999 and one of the new property developments that are part of the IC program. The remediation at the four sites was conducted as part of the remedial action in accordance with the ROD and recorded in the Remedial Action Report (EE, May 2000). The development was visited to show the proximity of this particular development to sites of known mercury contamination – the Carson River and a former mill site (New Ophir). All locations were sufficiently accessible to perform a physical assessment of the conditions. Site visit photographs are included in the Five-Year Review Trip Report attachment.

MS004. MS004 was the first site visited. This remediation site consists of a small park, residential property, and public property along River Street in Dayton. Remediation in 1999 consisted of excavation with backfilling and a 6-inch cap at the residence over 36,603 sq ft. The site visit team started at the southernmost point of MS004, the park, and walked along the site to the residential area. The park surface soils and grasses appeared to be in good condition and without the presence of mine tailings. The section of MS004 along the road is separated from the unremediated hillside by a retaining wall placed in 1999. The retaining wall was placed to prevent potentially contaminated soil from reaching the remediated area. Although minor erosion of the slope was observed to have occurred, it appeared that the retaining wall is functioning as intended because all spalled rock and soil was retained behind the wall. The hillside was seeded w/ native seed in 1999. Evidence of the seeding effort is still visible on the hillside (green patches); vegetation is present, but the site visit team did not determine if it was from the seeding or was there prior to the adjacent remedial action. The residential area has been altered since the time of the remedial action. The home that was present on the site has been demolished and no one lives on site. Additionally, there has been some excavation and grading adjacent to the remediated site. The adjacent property contains a mini-market with a large parking lot. It appears that the unpaved portion of the parking area has recently been graded. The material from the parking area has been pushed into piles that may be overlapping some of the remediated area. It is not clear from available figures if any of the grading may have impacted the cap placed at 150 Douglas Street. Additionally, the contamination within the graded and piled material, while possibly characterized during the RI, is currently unknown.

MS001. MS001 was the second site visited. This site consists of residential yards along the Carson River, east of Hwy 50 and Railroad Street. Remediation at MS001 consisted of excavation with backfilling and 2-feet of capping in some areas, over approximately 92,434 sq ft. The amount of site visited by the team was limited because MS-001 consists of private residences. The residences extend from the street to the river. The team conducted multiple drive-bys to view as much of the remediated areas as possible. Based on the portions that were visible from the road, the remediated areas did not appear to contain mine tailings or to have changed in land use from residential.

MS002. MS002, also in Dayton, was the third site visited and was also revisited later in the day. Site remediation consisted of excavation and backfilling of 988 sq ft. This site did not appear to be too difficult to locate initially. The team used figures from the RA Report and the first FYR. The area depicted in those figures is along a wash between the US Post Office and a credit union. The site was photographed and appeared unchanged post-remediation. Later in the day, back at the NDEP office, the team found pre-remediation drawings that showed a different MS002 location. An additional drawing showed site features such as other trailers and contours. The location in this drawing was much further south. Given the lack of firm features in the first site,

the USACE team members went back out to look at the newly discovered location. The new location lacked the features shown in one of the scoping figures. The USACE team then consulted RI maps for a possible location. The RI figures showed MS002 in another location. The team drove to that location and found a sufficient number of features that matched to decide that this, out of the three possible locations, was the most likely one. The primary similarity was one of the three trailers depicted in the site feature figure was present on site and oriented in the same manner as the drawing. The apparent location of MS002 is between 2nd and 3rd Streets, between Hwy 50 and Ziller Street (See Figure 2 of this FYR report).

MS030. MS030 was the fourth of four remediated sites visited. This site is located in Silver City. Site remediation at MS030 consisted of excavation of 4,416 sq ft of tailings to native soil. During the site visit, the team drove by the area depicted on the RA report figure to observe the remediated area. The site is located on what appears to be a single residence on the northern side of American Flat Road. The residence was not disturbed during the site visit. The area appeared to remain graded and free from tailings. However, further downstream, near but not adjacent to the residence, potential tailings were observed by the team.

On the way to MS030, the team stopped to observe a former mine site located at Sugarloaf Hill. The mill had been dismantled, but the stone walls that were built in the early 20th century remain. The former settling pond is still visible and was currently holding a small amount of water. None of the remediated sites are located near this mill; the mill was visited to provide perspective on the operations during the mining years.

After visiting the remediated sites, the team visited one of the new developments that have been part of the ICs process. This development, the Santa Maria Ranch, was located just outside of Dayton off of Hwy 50 East. NDEP representatives pointed out features such as the areas sampled, the areas with high mercury concentrations in the shallow soil that were excavated and backfilled, and the former mill area. The ICs program led the developer to collect and analyze 100 pre-finished grade surface soil samples, perform limited surficial excavation and replacement with clean fill, and collect and analyze over 400 finished grade surface samples to insure mercury concentrations in soil were within acceptable residential limits.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

X. OTHER REMEDIES

No additional remedies are applicable for the CRMS.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy described in the ROD was to accomplish two objectives. The first objective was to remediate surface soil at the residences and public areas. This action appears to be effective and functioning as intended. This assessment is based on observations made during the site visit and discussions with NDEP representatives. The other part of the remedy described in the ROD is ICs. That part of the remedy appears to be in a state of growth that should continue to be developed in order to be protective as intended in the ROD.

B.	**Adequacy of O&M** ☒ N/A
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. There are no early indicators of potential remedy problems.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Optimization for ICs is currently being implemented by NDEP as discussed previously. No additional opportunities are noted at this time.

Attachment 5

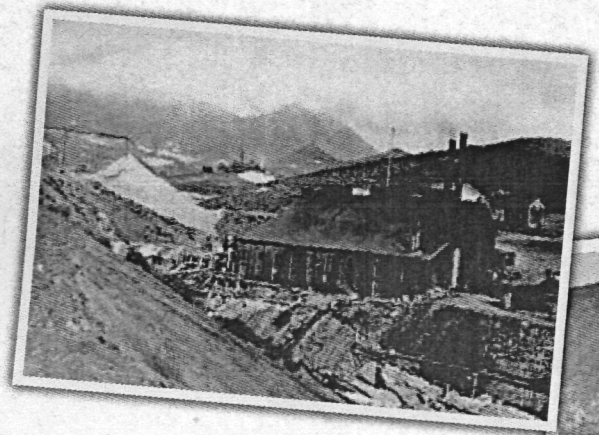
NDEP and Lyon County CRMS Brochure

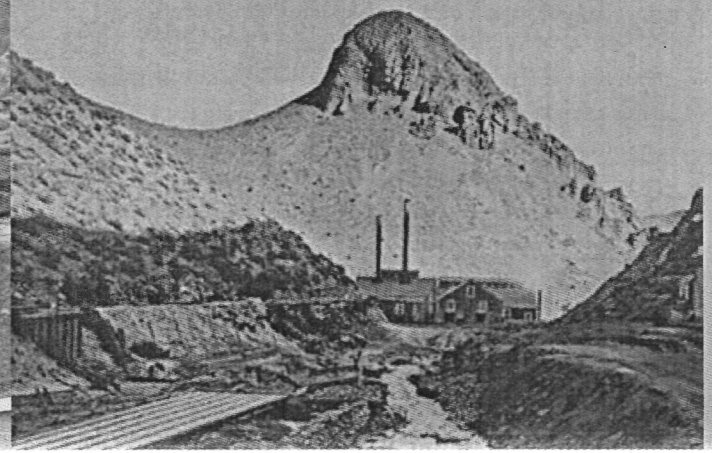
[This page intentionally left blank]

History

In the late 1800's more than 14,000,000 pounds of mercury used for mining was lost in the Carson River drainage system. With the primary transport mechanism for mercury being water, mercury has remained in the sediments of the Carson River, including Lake Lahontan and terminal desert wetlands of the Carson Sink and Carson Lake. Also, much of the mercury remains in the surface soils at the mill sites, areas downstream from the mill sites and in the drainages that connect the mill sites to the Carson River.

About 130 mills in the Carson River watershed have contributed to mercury in surface soils. They extend from Carson City to east of Dayton, and from Silver City and Gold Hill through Six-Mile Canyon and Gold Hill Canyon down to the Carson River.





Who to contact

The NDEP works with developers and utilities to provide guidance for sampling of soils in the Carson River area. The Lyon County Building Department will act as a point of contact for local residents and advise those who obtain building permits in the area to contact the NDEP's Bureau of Corrective Actions before disturbing soils more than two feet below the surface. If you are unsure if this applies to you, please feel free to contact the NDEP's Bureau of Corrective Actions for assistance.

Nevada Division of Environmental Protection
Bureau of Corrective Actions
http://ndep.nv.gov/mercury/index.htm
(775) 687-9368

Environmental Protection Agency
http://www.epa.gov/superfund/
(415) 947-8709

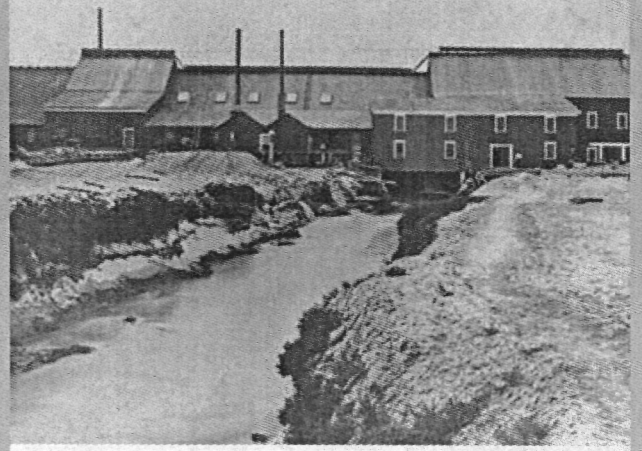
Lyon County
http://www.lyon-county.org/
(775) 463-6591

Nevada Department of Wildlife
http://www.ndow.org/fish/health/index.shtm
(775) 688-1500

Carson River Mercury Site

Areas potentially impacted:

Former Comstock-Era gold mill sites and the Federal Emergency Management Agency 100 year flood plain of the Carson River and its tributaries, particularly the Dayton area.



LYON COUNTY

ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

The Nevada Division of Environmental Protection (NDEP) is working to identify and monitor potential risks to the public, as a result of mercury in soil.

Residents in the areas below who are considering or involved in activities which may disturb the soils deeper than two feet need to contact the NDEP. Activities may include building an addition to a house, or outbuilding, deck construction, a swimming pool, planting trees and public activities such as trenching for underground utilities and cables.

Areas potentially impacted:
Former Comstock-Era gold mill sites and the Federal Emergency Management Agency 100 year flood plain of the Carson River and its tributaries, particularly the Dayton area.

Why is this important to you?

This area is listed on the Superfund National Priorities List. Superfund is the name given to an environmental program established to address abandoned hazardous waste sites. This area is included due to mercury from historic mining in the area.

Cleanup

Areas identified with mercury-contaminated surface soils underwent a cleanup process. The cleanup included the excavation of contaminated soils in the top two feet, offsite disposal of the soil, replacement of the contaminated soil with at least two feet of clean fill, grading and surface contouring.

Once cleanup conditions are met, commercial and residential developers within the cleanup area work with the NDEP to protect human health and the environment by sampling and demonstrating that the level of mercury in the top two feet of soil is at concentrations less than the health-based levels of concern. Soil below the top two feet has not been sampled and analyzed. Upon notification of an activity described above, the NDEP will determine if this soil should be tested.

Safety

Mercury can affect people's health through long-term, low-level exposure to mercury contaminated soil via ingestion. Children aged 1 – 6, who may inadvertently consume dirt while playing, are the most susceptible.

Wildlife

The Nevada State Health Division has issued health advisories recommending limits on consumption of fish species from six northern Nevada waters, due to elevated levels of methylmercury. The health advisories recommend no consumption of fish from Lahontan Reservoir and the Carson River from Dayton downstream to the reservoir.